REMARKS

Summary Of The Office Action & Formalities

Claims 4-14 are all the claims pending in the application. By this Amendment, Applicants are adding new claims 8-14 and canceling claims 1-3. No new matter is added.

Applicants thank the Examiner for initialing the references listed on form PTO/SB/08 submitted with the Information Disclosure Statement filed on October 20, 2003.

The prior art rejections are summarized as follows:

1. Claims 1 and 2 are rejected under 35 U.S.C. § 102(b) as being anticipated by Collyer (USP 5,931,419).

2. Claim 3 is rejected under 35 U.S.C. § 103(a) as being unpatentable over Collyer (USP 5;931,419).

3. Claims 4, 5, 6, and 7 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Collyer (USP 5,931,419) in view of Markley et al., "Attitude Control System Conceptual Design for Geostationary Operational Environmental Satellite Spacecraft Series".

Claim Rejections - 35 U.S.C. § 102

1. Claims 1 And 2 In View Of Collyer (USP 5,931,419).

Applicants have canceled claims 1 and 2, rendering their rejection moot.

Claim Rejections - 35 U.S.C. § 103

1. Claim 3 Over Collyer (USP 5,931,419).

Applicants have canceled claim 3, rendering its rejection moot.

2. Claims 4, 5, 6, And 7 Over Collyer (USP 5,931,419) In View Of Markley et al., "Attitude Control System Conceptual Design for Geostationary Operational Environmental Satellite Spacecraft Series".

In rejecting claims 4, 5, 6, and 7 over Collyer (USP 5,931,419) in view of Markley et al., "Attitude Control System Conceptual Design for Geostationary Operational Environmental Satellite Spacecraft Series", the grounds of rejection state:

> Collyer discloses the limitations as set forth above. Collyer does not disclose an attitude regulation loop including a corrector such that the bandwidth of said loop contains the lowest and most energetic frequencies of the flexible modes of said elongate members; said corrector of said loop is of the proportional, integral, derivative type and is associated with an attenuation filter; and said corrector of said loop is synthesized by means of advanced system control methods, the control method includes one or the H-infinity and Linear Matrix Inequality methods. Markley et al. teach an attitude regulation loop including a corrector such that the bandwidth of said loop contains the lowest and most energetic frequencies of the flexible modes of said elongate members in figures 7; wherein said corrector of said loop is of the proportional, integral, derivative type and is associated with an attenuation filter in figure 3; and said corrector of said loop is synthesized by means of advanced system control methods such as the H-infinity and Linear Matrix Inequality methods on page 252. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use the controls method of Markley et al. in the invention of Collyer because such modification would provide pointing performance and stability while avoiding low-frequency flexible modes of the spacecraft while providing superior rotational maneuvering with the CMGs. It is well known in the art that CMGs can be interchanged with reaction wheels to provide faster pointing, but aren't used as often because of their higher cost.

Office Action at pages 3-4. Applicants respectfully traverse this rejection.

Claim 4 of the present application sets forth that the bandwidth of the loop contains the lowest and most energetic frequencies of the flexible modes of said elongate members. The

combination of Collyer and Markley cited by the Examiner is deficient at least because the combination fails to teach or suggest a loop with the lowest and most energetic frequencies of the flexible modes of the elongate members.

The Examiner acknowledges that Collyer does not disclose an attitude regulation loop including a corrector such that the bandwidth of the loop contains the lowest frequencies of the elongate members. The Examiner attempts to correct this deficiency by citing Markley. However, Markley also fails to teach or suggest such a feature. Instead Markley teaches a controller bandwidth of 0.1 Hz, which avoids "the significant low-frequency flexible modes of the spacecraft" (*see* Markley page 250, first section of column 2). Markley teaches that the first significant flexible mode of the solar array is expected to be between 0.5 Hz and 1.0 Hz (*see* Markley page 250, first section of column 2). Markley specifically teaches that the controller bandwidth avoids the significant low-frequency flexible modes and cites a controller bandwidth of 0.1 Hz, which is out of the range cited for the first significant low-frequency flexible mode. Therefore, Markley is the opposite of claim 4 with regards to this feature. While claim 4 sets forth a controller which contains the lowest and most energetic frequencies of the flexible modes of the elongate members, Markley specifically avoids such frequencies.

Furthermore, Markley describes a method of dealing with disturbance frequencies higher than the control loop frequency. Markley accomplishes this by adding an extra control loop using the satellite motion sensors and servo actuators located on the satellite payload to compensate for motion caused by high frequency disturbances. It does not use satellite actuators for the compensation. Fig. 7 is not directed to the bandwidth of a control loop and does not teach or suggest claim 4.

In view of the above, claim 4 and its dependents are allowable over the combined teachings and suggestions of Collyer and Markley.

Claim 6 is also allowable by reason of its dependency and at least because the Kalman filter taught by Markley is not a controller design method. The non-limiting embodiment of Fig. 3 of the present application illustrates a unit for processing signals 42 and a corrector unit 50. The unit for processing signals 42 is used to format the signals so that they represent the attitude of the satellite (*see* page 6, lines 6-8). The corrector unit 50 is used to prevent instability of the regulation loop and benefits from the use of an advanced system control method, such as the $H\infty$ and Linear Matrix Inequality methods (*see* page 6, lines 10-19). The Kalman filter of Markley is used to used to estimate the satellite attitude. It is not an advanced system control method as set forth in claim 6. Therefore claim 6 is also allowable at least because the combination of Collyer and Markley fails to teach or suggest an advanced system control method as claimed.

New Claims

For additional claim coverage merited by the scope of the invention, Applicant is adding new claims 8-14. Claim 8 is allowable at least for reasons similar to those given above with respect to claim 4. Claims 9-14 depend from claim 8 and are allowable at least because of their dependency.

Conclusion

In view of the above, reconsideration and allowance of this application are now believed to be in order, and such actions are hereby solicited. If any points remain in issue which the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned at the telephone number listed below.

The USPTO is directed and authorized to charge all required fees, except for the Issue Fee and the Publication Fee, to Deposit Account No. 19-4880. Please also credit any overpayments to said Deposit Account.

Respectfully submitted,

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